REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
04-05-2009	FINAL	

4. TITLE AND SUBTITLE

Knowledge Management: An Effort to Keep Pace with Information

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Darryl B. Martin, LCDR, USN

Paper Advisor (if Any): Professor David R. Carrington

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Joint Military Operations Department
Naval War College
686 Cushing Road
Newport, RI 02841-1207

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Distribution Statement A: Approved for public release; Distribution is unlimited.

13. SUPPLEMENTARY NOTES A paper submitted to the Naval War College faculty in partial satisfaction of the requirements of the Joint Military Operations Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.

14. ABSTRACT

In a network centric environment, a multitude of platforms and communication systems will be linked to provide all levels of command with near real-time data to feed their decision-making cycles. The ability to cope with this wealth of information will depend on the organization's ability to adapt and learn faster than the enemy. To aid this accelerated learning process, knowledge management (KM) allows for the capture and exchange of experiences and lessons learned. The Joint Commanders and their organizations must leverage KM resources to allow for the efficient transfer of knowledge. The process of capturing the elusive tacit knowledge an individual possesses is highly social and relies on an understanding by the commander to create a culture for collaboration. This paper explores the role of an operational commander in optimizing the use of knowledge management resources to increase learning now and create a knowledge-base for the future.

15. SUBJECT TERMS

Knowledge Management

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Chairman, JMO Dept
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED		30	19b. TELEPHONE NUMBER *(include area code)* 401-841-3556

Standard Form 298 (Rev. 8-98)

NAVAL WAR COLLEGE
Newport, R.I.

KNOWLEDGE MANAGEMENT: AN EFFORT TO KEEP PACE WITH INFORMATION

by

Darryl B. Martin

LCDR, USN

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

04 May 2009

Table of Contents

List of Illustrations

ABSTRACT

KNOWLEDGE MANAGEMENT: AN EFFORT TO KEEP PACE WITH INFORMATION

In a network centric environment, a multitude of platforms and communication systems will be linked to provide all levels of command with near real-time data to feed their decision-making cycles. The ability to cope with this abundance of information will depend on the organization's ability to adapt and learn faster than the enemy. To aid this accelerated learning process, knowledge management (KM) allows for the capture and exchange of experiences and lessons learned. The Joint Commanders and their organizations must leverage KM resources to allow for the efficient transfer of knowledge. The process of capturing the elusive tacit knowledge an individual possesses is highly social and relies on an understanding by the commander to create a culture for collaboration. This paper explores the role of an operational commander in optimizing the use of knowledge management resources to increase learning now and create a knowledge-base for the future.

"Leaders in the past have focused primarily on the growth of Information Technology for a faster battle rhythm vice investing in their human capital and the knowledge they possess."

INTRODUCTION

An operational commander's decision-making cycle relies on relevant, current, and accurate information to remain superior to the enemy. This provides the commander with the ability to seize the initiative and drive the battle rhythm. Efforts to provide the means to a superior decision-making cycle have been devoted towards information management (IM), including the creation of a network centric environment. A growing number of platforms and communication systems are becoming interconnected to provide users at all levels of command with near real-time sensor data. Information will be tagged at the operational level through a series of filters in an effort to prevent information overload and the slowing of the decision-making cycle. The application of these filters is derived from the knowledge and foresight gained through past experiences. As information feeds the decision-making cycle, knowledge needs to be applied to add value to the information. The decision maker's ability to learn faster than the enemy with the help of knowledge management (KM) will play an integral role in future combat. KM has been defined as "the development of tools, processes, systems, structures and cultures explicitly to improve the creation, sharing, and use of knowledge critical for decision making," and differs from IM as it focuses on the capture and sharing of insights and experiences.[1] Although the concept of KM has existed since 1994, it is only now starting to mature in the joint environment. Leadership must understand the importance of knowledge in an information saturated environment and the role it will play in

[1] David DeLong and Patrica Seemann, "Confronting Conceptual Confusion and Conflict in Knowledge Management," *Organizational Dynamics* 29, No. 1, (1 July 2000), 33.

the future. The ability of the operational commander to harness the knowledge of his organization is essential in the network centric environment. This paper explores the role of the operational commander in optimizing the use of KM resources to increase the knowledge level of his staff and subordinate commanders. The goal is to enable a more responsive staff to adaptive threats. This paper will further discuss the types of knowledge, methods of exchanging knowledge, the tools available to create and manage knowledge, and recommendations for influencing change through human capital.

BACKGROUND

Information Technology (IT) systems have grown exponentially to feed the increasing demands for information in the quest for superior decision-making cycles. The main consideration for this growth is due to the large applicability of IT across all sectors of the global economy and its ability to affect every function of an organization.[2] Development has been extensive since both public and private industries can benefit from the successes of each other. Therefore, IT can be applied through cost and time effective measures as a solution to a variety of communication and information problems. This wide variety of available solutions has also allowed IT to infiltrate all levels of command as the backbone to C2 and delivers the information needed by commanders and their staffs.

The wide application of IT has also fostered a world-wide culture of speed and connectivity. The luxury of increased bandwidth has always been enjoyed in the United States before being experienced at the front line. Domestically, we have grown to accept internet access and transfer rates that allow us to seamlessly complete bank transactions, receive news media, and view feature length movies in high definition. When experiencing

[2] Fred Luthans, *Organizational Behavior* 10th ed, (New York, NY: McGraw-Hill Irwin, 2005), 34.

data transfer rates at less than this assumed norm, there is a perception of inadequacy. The members of the U.S. Armed Forces could be comparable to the returning prisoner in Plato's Allegory of the Cave who has been enlightened and now must become accustomed to the darkness. We thirst for more current information, and if the gap cannot be filled with speed, further lines of connectivity are the next best option. (If the pipe is too small, add another pipe.) A joint staff can use a variety of tools to connect including the Joint Network Transport Capability (JNTC) suite which provides "secure and non-secure voice and data links, interfaced common operational picture tools, and near real-time information transmissions."[3] Computer interfaces on Secret Internet Protocol Router Networks (SIPRNET) and Non-secure Internet Protocol Router Networks (NIPRNET) can receive an average of over 150 emails per day for a primary staff officer.[4] These tools connect the staff to a variety of resources to handle their tasks, and further add to the nested superstructure of integrated systems. Once a connection is established to an information source, the request to increase the bandwidth of that connection can be expected as technology is improved. This creates a cycle of demand for both speed and connectivity.

In this environment, the growth of IT has created a tempo of change that the operational commander finds difficult to manage. It has caught the attention of leaders at the strategic level. The Chief of Naval Operations and the Commandant of the Marine Corps have created an additional review process for its growth, but **"**there was no way [they] had the bandwidth in the leadership to do 100 of these every year."[5] IT solutions are being tempered with IM processes to provide information that is accurate and relevant in addition

[3] Stephen H Bales, "Burnout: Staff Exhaustion," *Military Review* (1 July 2008), 83, http://www.proquest.com/ (accessed March 22, 2009).
[4] Ibid.
[5] "Navy Updates Acquisition Instructions, Adds In Gate Review Process," *Defense Daily* (9 December 2008), 15, http://www.proquest.com/ (accessed February 22, 2009).

to current. In the Global Information Grid, all data passed between nodes including those from legacy systems or joint, multinational, coalition, IGOs, and NGOs sources will be tagged, and a series of filters will control classification, data integrity, relevance, and dominance.[6] At the operational level, these filters will need to be planned through the development of the commander's critical information requirements (CCIRs) early in the planning phase, and they will need to be updated throughout the operation. "Action officers and decision makers need to be aware of the processes and procedures to be able to effectively use available system capabilities to share pertinent information."[7] The development of the information requirements and their updates assumes a level of knowledge, which must be constantly developed as the environment changes.

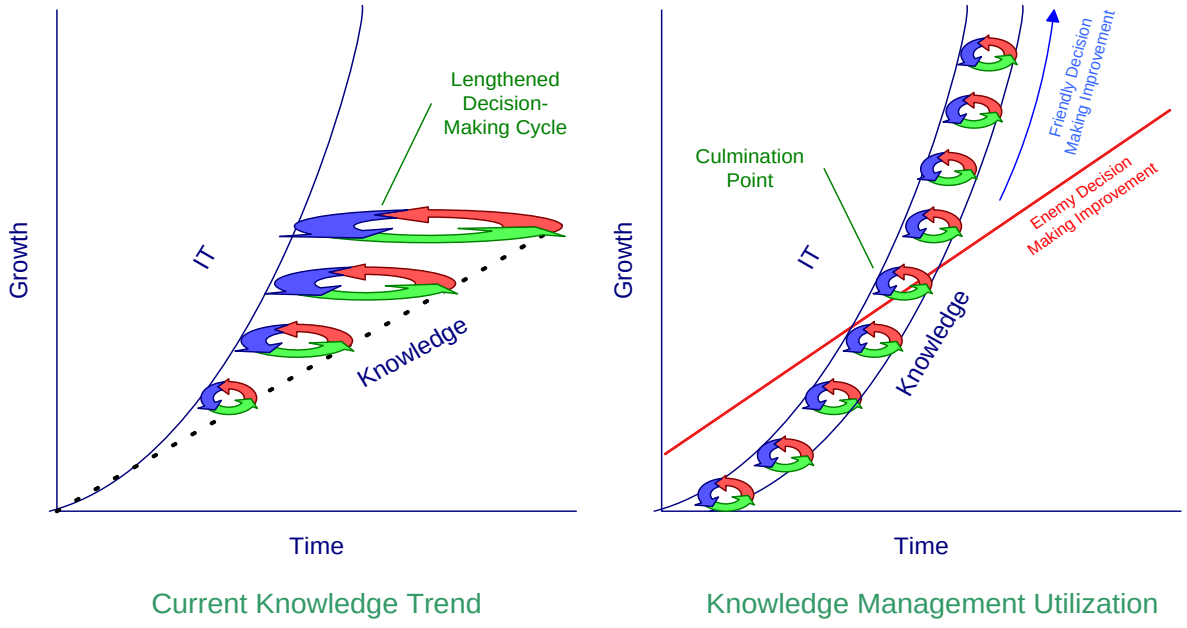

Figure 1: IT-Knowledge Gap Effects on Decision-Making

[6] Samuel D. Bass and Rusty O. Baldwin, "A Model for Managing Decision-Making Information in the GIG-Enabled Battlespace," *Air & Space Power Journal* (1 July 2007), 106-108, http://www.proquest.com/ (accessed March 22, 2009).

[7] Chairman, U.S. Joint Chiefs of Staff, *Doctrine for the Armed Forces of the United States*, Joint Publication (JP) 1 (Washington, DC: CJCS, 14 May 2007), IV-16.

The exponential growth of IT into all aspects of control, coupled with the need for continuous oversight of IM measures, has out paced the growth in knowledge (see figure 1). The information may travel faster and to more users, but the end user may not have the knowledge to apply this information and becomes overwhelmed, thus leading to indecision. The lack of knowledge has begun to manifest itself in what is know as information overload, which "describes an excess of information that results in the loss of ability to make decisions, process information, and prioritize tasks."[8] According to a study of challenges facing companies in the knowledge economy, "information overload costs the U.S. economy $900 billion per year in lowered employee productivity and reduced innovation."[9] Additionally, the lack of knowledge has affected operational-level staffs who feel unprepared and unable to cope with the inundation of information.[10]

ANALYSIS / DISCUSSION

One might argue that the problem of managing the knowledge of a staff and subordinate commanders is not the task of an operational commander. The thought may be that this responsibility can be delegated. However, the problems and enemies the commander is facing are dynamically complex, meaning the solutions that were applied to similar problems in the past are not always the solution to the current problem. In a dynamically complex environment, the same action does not always produce the same effects, and the obvious solutions produce unforeseen consequences. By supporting Osama Bin Laden against the U.S.S.R. during their invasion of Afghanistan in the 1980s, the United

[8] "Basex; Information Overload Now $900 Billion Cost to U.S. Economy," *Science Letter* (6 January 2009), 28, http://www.proquest.com/ (accessed February 22, 2009).
[9] Ibid, 28.
[10] Bales, "Burnout," 83.

States unknowingly provided the means for a terrorist to attack the U.S. in 2001. Similarly, due to globalization and the increase of social networks, the solutions may have local effects and consequences that are dramatically different in other areas of the world. The decision to make a time-sensitive strike on leaders of a terrorist network at a funeral may eliminate the threat of that network and constitute a decisive victory. However, the effects could cause international discontent and facilitate the rise of other terrorist networks. The knowledge of how this organization has responded in the past, the cultural values of the public, and the unique demographics of their supporters may allow the commander to maintain the initiative and limit damaging effects. The operational commander must have a holistic system view of the operational environment and maintain the initiative by responding at multiple levels and sometimes outside his immediate control. The holistic view requires a shared knowledge within the organization to allow the commander to adapt quicker than the enemy and see the larger patterns of change. A culture of sharing fosters the exchange of knowledge. "In dealing with organizational culture, we must have strong, committed leadership; a collaborative, open environment that emphasizes sharing."[11] Once shared, past experiences and lessons can be leveraged to provide a rapid, adaptive, and responsive behavior.

Attempts have been made to delegate the responsibility of managing knowledge with limited results. This responsibility usually falls under the Information Management Officer (IMO) that may be assigned to a staff as part of "some semblance of strategic information alignment and to coordinate the collective concerns of the IM community."[12] KM has been associated with information management due to its high reliance on a flow of information.

[11] Harry D Raduege Jr., "Network Operations Mandate Critical Considerations," *Signal* (1 July 2008), 100, http://www.proquest.com/ (accessed March 22, 2009).
[12] Brian A. Mace and Gary Thomason, "Knowledge Management Is Combat Power," *Marine Corps Gazette* (1 June 2008), 37, http://www.proquest.com/ (accessed March 22, 2009).

This has caused it to become another duty of the IMO. The issue develops in the employment of this IMO at the operational level to "preserve the enterprise knowledge repository."[13] As previously discussed, KM requires a unity of effort driven by the command culture. Anything less than a command effort proves to be too daunting a task and efforts are diverted elsewhere. In the case of the IMO, they are typically mismanaged and "positioned in a realm of competing priorities, operating somewhere between chiefs of staff, the operations officers, and the communications officers."[14] This can be caused by the operational commander's misunderstanding over the importance of knowledge.

A Joint Force Commander's ability for leveraging knowledge starts with understanding knowledge, how it is created and how it operates in practical settings. Knowledge studies have shown "training programs gave markedly inadequate attention to informing people of [knowledge tools] and helping people to learn to navigate them. People who had been at the firm for extended periods often did not know about the existence of databases containing information relevant to their area. Moreover, inadequate categorization and quality control made finding state-of-the-art information held in the database very time-consuming."[15]

KNOWLEDGE DEFINED

There are two types of knowledge identified – explicit and tacit. Explicit knowledge is identified as "knowledge that has been or can be articulated, codified, and stored in certain media. It can be readily transmitted to others. The most common forms of explicit knowledge

[13] Ibid, 40.
[14] Mace and Thomason, "Knowledge Management Is Combat Power," 38.
[15] Roy Lubit, "Tacit knowledge and Knowledge Management: The Key to Sustainable Competitive Advantage," *Organizational Dynamics* 29, No.4 (12 July 2001), 173.

are manuals, and documents, or other digital media."[16] This is the knowledge contained in rules, regulations, guidelines, and directives, and is the easiest to share and store. Tacit knowledge, on the other hand, is defined as "knowledge that people carry in their minds and is difficult to access and not easily shared. People are often not aware of this knowledge they possess and how valuable it can be to others. It is considered more valuable because it provides context for people, places, ideas, and experiences."[17] Tacit knowledge includes insight and intuition that is gained through experience. Knowledge development is social in that it is not only gained through personal experiences, but the shared experiences of others. Therefore, collaboration becomes the cornerstone of efficient KM. In order to manage knowledge, a commander needs to address collaboration and tools that help people collaborate. This is a very organic process with many human variables.

Nonaka's knowledge conversion model (figure 2) explains four methods of converting explicit and tacit knowledge – externalization, internalization, combination, and socialization. Externalization is a process of using a common language to convert personal tacit knowledge into shared explicit knowledge. Internalization is a process of expanding one's tacit knowledge by internalizing explicit knowledge. Combination is the process of generating new explicit knowledge from existing explicit knowledge. According to Nonaka, socialization is the most complex form of exchange and can be explained as "the process of creating tacit knowledge through shared experience."[18]

[16] U.S. Army, *Army Knowledge Management and Information Technology*, Army Regulation (AR) 25-1 (Washington, DC: Headquarters Department of the Army, 4 December 2008), 121.
[17] Ibid, 130.
[18] Feng-Kwei Wang, "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance," *Performance Improvement Quarterly* 19, no. 2 (1 April 2006), 177, http://www.proquest.com/ (accessed March 22, 2009).

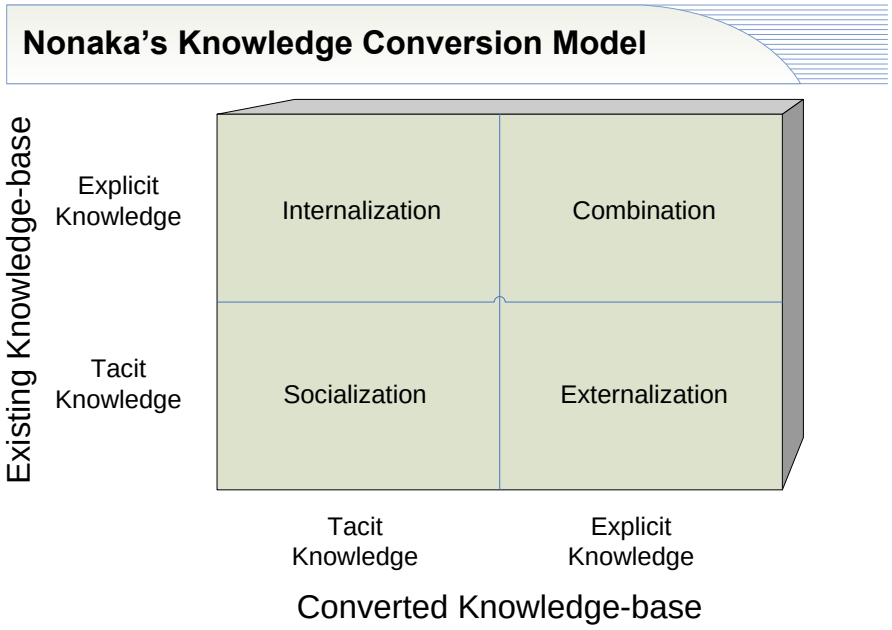

Figure 2: Nonaka's Knowledge Conversion Model

KNOWLEDGE TOOLS: THE ENHANCED EXCHANGE OF KNOWLEDGE

School houses are the oldest centers for knowledge generation and management through collaboration. The explicit knowledge found in the syllabus, guidelines, technical data, and directives make up the core knowledge base. This knowledge is living even at this level although change and adaptation is slow. Instructors, if rotated from the field, bring fresh tacit knowledge, which can be externalized through adapting the lesson materials. Their tacit knowledge can also be refreshed with a renewal of explicit knowledge through internalization as they dive into the institution's knowledge base and prepare for teaching and answering student questions. Through socialization, students and instructors can share their tacit knowledge and develop new tacit knowledge. Instructors can also practice socialization with their colleagues. Combination can occur with instructors venturing outside their areas of expertise to discover new explicit knowledge. This branching out can pull new knowledge

for application in the expert's subject area. Although the school houses mostly focus on internalization for the student and externalization for the instructors, the interactions are complex as knowledge is transferred amongst different bodies. The main body of knowledge in a school house is explicit knowledge.

With this understanding of knowledge, the leaders need to find value in the KM technologies that can be leveraged. For example, the processes of internalization from the school house body of knowledge have already been expedited through the use of web portals. The added benefit to the commander is that personnel do not need to travel to the school house to learn. The Navy's E-Learning website now posts over 1,000 courses and just marked 100,000 total course completions as of June 2007.[19] Other Services have created similar educational portals and are beginning to unify their efforts. Joint Knowledge Online (JKO) offers over 206 courses[20] to help an operational commander maintain readiness using the Joint Task Force Headquarters Master Training Guide. These systems are vital for maintaining a knowledge baseline for administrative and technical skills. However, E-Learning systems "frequently do not have the capability of capturing and transferring content-specific, organizational-unique knowledge such as tacit knowledge of the company commander operating in an asymmetric warfare environment.[21]

This form of online system is not easily updated and does not provide a medium for collaboration and the transfer of tacit knowledge. This is a one-way exchange of explicit knowledge. Even though contact may be established with the developer of the course through

[19] Terry Welch, "Navy E-Learning Afloat Achieves Milestones," *US Department of Defense Information / FIND* (15 June 2007), 2, http://www.proquest.com/ (accessed March 15, 2009).
[20] U.S. Joint Forces Command, "Joint Knowledge Online," http://jko.cmil.org/about-jko (accessed 21 March 2009).
[21] Doug McCallun, "Avoiding the 'Army of Professional Amateurs' Paradox," *Defense & AT-L* 37, No. 2 (17 August 2008), 14, Military & Government Collection, EBSCOhost (accessed February 24, 2009).

a linked email address, it does not provide a quick exchange of tacit knowledge, nor does it offer the ability to capture it from the user. E-Learning develops an expected level of knowledge for graduates. This is particularly important in developing a medium or language to share tacit knowledge. A common understanding using explicit knowledge must first be achieved by the participating parties before collaboration can be established through dialogue. This is the goal of online educational sources from a KM perspective and is the gateway to social collaboration.

LESSONS LEARNED: BUILDING A KNOWLEDGE WAREHOUSE

Another source of knowledge that a commander and his staff can leverage is lessons learned. Lessons learned have been a resource for collecting tacit knowledge since language was created. History is a form of recording lessons learned. However, history is usually written by the winners of a war and perceptions can shield the truth. Lessons learned are also greatly affected by socio-political, psychological, and other human factors that shield the perception of truth or hide the underlying lesson. In the past, immense studies of history and lessons learned were required to find resources and make comparisons to find the hidden meaning that could be applied for future use. Technology has aided not only making comparisons, but also recording lessons learned. In 2006, the CJCS Joint Lessons Learned Program (JLLP) was created to unify efforts of collecting and distributing tacit knowledge by fusing the independent service databases. Although this does not embody all the lessons learned databases in the DoD, such as the Military History Institute's lessons learned, it is a step in the right direction for the war fighter.

The JLLP, governed by CJCSI 3150.25D, provides a more efficient way to covert and share a large collection of knowledge. The program collects observations, issues, and lessons learned at all levels of command both actively and passively from any organization, such as a Joint Staff, Combatant Command, Service, or coalition partner, to cover operations, training events, exercises, or other activities.[22] This allows diverse sources to input their tacit knowledge. At the operational level, the Combatant Commands, Services, and Combat Support Agencies conduct collection and analysis to catalog lessons learned, validate and analyze observations, and resolve issues. Once data is transferred and integrated to the JLLP it can be searched by analysts and subject matter experts using an intelligent operating search capability, which provides "an extensive range of functionality and performs advanced operations with conceptual and contextual analysis and retrieval on information in real time."[23]

HARNESSING THE KNOWLEDGE OF MANY VS. A BODY OF EXPERTS

Capturing tacit knowledge through lessons learned has been a challenge which can be overcome through rewards. For large exercises, an active collection team may be assigned to extract this knowledge and submissions of lessons learned are required, but for the individual, "knowledge is the basis of power and respect, and people are often hesitant to share knowledge lest their power decrease."[24] An incentive needs to be made that is greater than the power gained through this knowledge and the time lost due to their participation. "Knowledge sharing efforts such as mentoring, responding to questions by others, and

[22] U.S. Central Command, "CENTCOM Lessons Learned," http://hqsweb03.centcom.smil.mil/lessons.asp (accessed 21 March 2009).
[23] Chairman of the Joint Chiefs of Staff, "Joint Lessons Learned Program," CJCSI 3150.25D (Washington, DC: CJCS, 10 October 2008).
[24] Lubit, "Tacit knowledge and Knowledge Management," 172.

making contributions to databases and discussion groups, need to be measured and rewarded."[25] Staffs traditionally possess an intrinsic motivation especially when they understand the consequences for a lack of effort. Each individual is motivated differently to share, and models from Lawyer and Pratt rewards-based theory to Maslow's hierarchy of basic needs offer commanders tools to motivate. It is the operational commander that can offer rewards and inspires the culture of sharing for his staff and subordinate commanders.

Inspiring all levels to participate in lessons learned, including the individual, allows diverse sources to input their knowledge. This means there is a wide range of explicit knowledge that can now be intercepted and accessed for comparison to find the hidden truth for internalization. However, there is a limit to one's knowledge for interpreting the truth, so lesson learned analysts can help by adding their interpretation of the provided experiences. These groups of experts have a large amount of tacit knowledge themselves to aid in internalizing the diverse input and externalizing their findings in summary reports that can also be found in the database. For the individual researcher, it is a matter of time and trust in accepting these reports as truth. Does he have time to conduct his own research? Does he consider himself a resident expert on the subject? If there is doubt to the analyst's opinion or he considers himself an expert, the raw issues and observations are available in the database to draw independent lessons learned on the subject. The JLLP becomes a source of knowledge for various levels of interpretation based on one's expertise and available time.

Levels of knowledge are not only grouped through users and analysts, but the JLLP is framed using a series of categories to handle the large volume of knowledge. By adding categories, it allows the knowledge to be bound for the interpretation of the analysts. After all, there is a limit to one's expertise. Analysts and subject matter experts can now be

[25] Ibid, 173.

assigned to the lessons pertaining to their field. If the category is too narrow, the chance exists that there are too few experts, or one expert's opinion may predominately prevail leading to group think. If the category is too wide, the range of an analyst's expertise comes into question again. Some staffs have stated "inadequate categorization and quality control made finding state-of-the-art information held in the database very time-consuming,"[26] and have called for the traditional organization of categories along functional lines into question.

Since reorganization can be costly and debate on expertise can be infinite, the JLLP offers a solution through its search capability. With "an intelligent operating search capability … that can provide an extensive range of functionality and perform advanced operations with conceptual and contextual analysis and retrieval on information in real time (such as hyperlinking, clustering, profiling, retrieving, categorizing)."[27] This capability in the JLLP allows boundaries to be developed real-time by the user and adds intelligent search capabilities to lead the researcher to responses. This capability guides the researcher through bodies of knowledge with suggestions which aid discovery. This type of intelligent search capability is much like that used by Amazon, which can make suggestions based on keywords and trends from similar searches or refine the suggestions through a history of items that were tagged as relevant during the search. In an effort to save even more time navigating through the knowledge contained in the JLLP, intelligent notifications via email are to provide staff researchers with newly captured relevant tacit knowledge.[28] This knowledge and timely expertise gained through intelligent searches can dramatically aid planning, crisis response, and extends the use of tacit knowledge captured through lessons

[26] Ibid, 173.
[27] Chairman of the Joint Chiefs of Staff, "Joint Lessons Learned Program," CJCSI 3150.25D (Washington, DC: CJCS, 10 October 2008).
[28] R. Weber and D. Aha, "Intelligent Delivery of Military Lessons Learned," (15 July 2002), 1, http://www.sciencedirect.com/ (accessed February 28, 2009).

learned beyond those who witnessed the initial experience. Therefore, the JLLP becomes a critical tool for the operational commander and his staff.

KNOWLEDGE NETWORKS

Another emerging KM tool for the operational commander and his staff are knowledge networks. As the importance of KM has been recognized as a solution to maintaining an intellectual edge when downsizing, the DoD is consolidating its knowledge resources into web-based portals.[29] The Army has led the way in the development and consolidation of knowledge tools with Army Knowledge Online (AKO). Other services have followed suit with Navy Knowledge Online, the Air Force Portal, and a Marine Corps SharePoint Server. Joint Knowledge Online (JKO) has also been introduced for the operational commander and his staff. The most recent knowledge network introduced in 2007 has been DoD's Defense Knowledge Online (DKO) to "facilitate knowledge management, collaboration, and information-sharing across DoD and other government agencies."[30] By 2010, "DKO will consist of a personalized, user-defined, web-based presentation that allows for secure access to enterprise services, applications, and content. It will provide warfighters, policymakers, and support personnel with portal capabilities..."[31] As funding resources become unified, so will the knowledge networks. These networks show potential for growth with similar web-based collaborative tool sets that give users a familiar interface in each network and provide a common structure for system integration. While

[29]Katherine M. Peters, "Intelligence lost," *Government Executive* (1 November 1996), 20, http://www.proquest.com/ (accessed March 20, 2009).
[30] "DOD Builds on AKO to Create 'DKO'," *Army Logistician* (1 May 2007), 47, http://www.proquest.com/ (accessed March 15, 2009).
[31] Ibid, 48.

these knowledge networks are still new, they do not derive their power as the JLLP does with its vast collection of tacit knowledge.

The knowledge networks draw their power as a KM tool from collaboration. The chat rooms, blogs, email address links, hyperlinks, and portals allow for the real-time collaboration across multiple forms of media to provide a near social environment for exchange, much like Facebook. This environment allows all the senses to be invoked simultaneously with multiple forms of communication, such as a camera, microphone, Microsoft Word, Microsoft PowerPoint, and voice communication or chat to facilitate knowledge transfer. This is the quickest means for an operational commander to adapt his decision making cycle with updated knowledge from one or multiple experts in a given field. Determining who is an expert and whose knowledge is worth learning still remains an issue. Currently there is no intelligent search capability to help find the way and this expert body must be known before hand, especially for subjects that are under developed.

For identified areas of rapid knowledge growth, such as the development and use of IEDs, knowledge and information can be fused with the oversight of experts in what has been called KnIFE (Knowledge Information Fusion Engine). "The ultimate goal for USJFCOM is to transform KnIFE into a major knowledge center that will provide expert knowledge."[32] Timely information is joined to an existing body of explicit knowledge. If internalization does not provide the knowledge to aid decision-making, socialization through collaboration with experts can create a timely solution. "While technology is part of it, KniFE encapsulates collaboration, information fusion, business intelligence, assessing legacy data systems,

[32] Harrison Donnelly, "KnIFE Against Terror," *Military Information Technology* (20 August 2007), 24, http://www.proquest.com/ (accessed March 15, 2009).

getting information to the right people at the right time."[33] It is a responsive system to providing knowledge on areas of established interest and a rapidly growing body of knowledge.

CONCLUSION

In the network centric environment, seemingly endless connectivity and global reach coupled with the exponential growth in the speed of delivery and processing of information will flood the operational commander and his staff. The ability to add value to this information for an adaptive decision-making cycle relies on the embodied explicit and tacit knowledge. Since one's knowledge is limited, and therefore, the body of knowledge in one's staff is limited, sources of knowledge must be leveraged internal to the staff as well as from outside the immediate environment. Explicit knowledge can be used to establish a baseline of understanding and is most easily internalized through E-learning resources. Tacit knowledge, especially the unique and diverse experiences of the operational staff, is perishable and must be preserved through collaboration or large databases for intelligent searches. The JLLP provides a large database of such knowledge that can be intelligently searched, so comparisons can be made to find a plausible truth to internalize. If tacit knowledge has not been externalized into a diverse searchable database, a body of experts must be readily accessible. Socialization through collaboration is the quickest means of sharing the tacit knowledge of experts, but does not provide the opportunity to externalize the knowledge for preservation. The developing knowledge networks offer a solution to capture this knowledge and consolidate all knowledge resources. Where new knowledge is in demand, information

[33] Ibid, 26.

and explicit knowledge can be fused with technology under the oversight of experts to create a responsive knowledge base.

All of these interactions and knowledge transfers rely on a sharing atmosphere that is developed by the operational commander. Leadership must understand the importance of leveraging the knowledge of an organization in an information saturated environment. The growth of our knowledge base relies on an investment in our human capital and nurturing the sharing of knowledge. The leadership applied today will reap the benefits of a learning atmosphere for an immediate response to our current problems in a dynamically complex world. Additionally, leadership will provide the means for a more adaptive and responsive behavior to tomorrow's unseen problems.

RECOMMENDATIONS

The concept of KM is now establishing itself across the joint environment in the form of tools, but the cultures have been slow to adapt. The Army is continuing to lead the way after providing AKO, the most mature of the knowledge networks. Other services and staffs can benefit by adapting and building on the Army's recently developed Principles of Knowledge Management from June 2008 (appendix).[34] These principles cover three main tenets for knowledge management with some expanding into the technical realm. The operational commander from any service can have the most dramatic effect with a focus on the tenet of people/culture.

The first principle outlines a need to train and educate leaders in KM. Without understanding the impact of KM and what it can bring to the fight, particularly a more

[34] U.S. Army, "Army Knowledge Online," https://www.us.army.mil/suite/page/doc/10713107 (accessed 21 March 2009).

adaptive decision-making cycle, KM resources will continue to be underutilized or mismanaged. Training must be conducted as an intermediate educational process prior to making command. The transitions of knowledge in an operational environment should be outlined, so a commander can better understand the relationships he is enhancing and leveraging to achieve the mission objective. Additionally, the staff should undergo training upon arrival in regards to any operational KM doctrine, tools, and the processes for sharing knowledge.

The second principle under the people/culture tenet is rewarding knowledge sharing. Although participation in some knowledge collection activities such as lessons learned is ordered, engaging in such activities should not harm their performance as noted in the private sector.[35] Poor performance evaluations can effect promotion and pay and not promote a behavior of sharing knowledge. Rewards can be in the form of evaluations for selection boards and promotion, ribbons or medals, or granting a request such as leave. Some of these rewards may breed cynicism if unnecessarily utilized. There are many ways for a commander to reward his staff and subordinate commanders in relation to the task performed and the needs of the command. On the other hand, many of the members of our all volunteer service are intrinsically motivated, so the solution may be to provide a path of least resistance. A path of immunity should be provided for accurate reporting, and a culture of blame should be eliminated. Time is also a reward, so tools need to capture details immediately and expeditiously. The definitive reward is the continued belief that one's inputs will improve the system and have best served the needs of our country.

The final principle directly relating to the operational commander involves establishing a doctrine of collaboration. Although collaboration involves many levels of

[35] Lubit, "Tacit knowledge and Knowledge Management," 167-171.

communication, is highly social, and adapts quickly, a doctrine can be established, not to stifle innovation but to create guidelines to foster improvement. A doctrine can lay a foundation for all the principles and directly relate it to the KM resources provided. Time must be devoted to sharing during the pre-combat, combat, and post-combat phases as "sharing knowledge requires that time be taken away from other responsibilities that have a higher priority."[36] Open dialogs with a questioning attitude must be established to foster critical thinking. Observations to the health of the innovative spirit and dialogue within a staff can be witnessed during staff meetings. If fatigue, impatient personalities, and lack of motivation plague the staff, collaboration will cease. If the collaboration between staff members is weak, then it is likely collaboration outside the staff is as well. Strong doctrine must be provided to create and preserve a knowledge sharing environment.

[36] Ibid, 172.

APPENDIX: U.S. Army Principles of Knowledge Management

People / Culture Dimension

1. Train and educate leaders, managers and champions.
2. Reward knowledge sharing and make knowledge management a career-enhancing activity.
3. Establish a doctrine of collaboration.

Core Principles of Collaboration

4. Use every interaction, whether face-to-face or virtual, as an opportunity to acquire and share knowledge.
5. Prevent knowledge loss.

Process Dimension

6. Protect and secure information and knowledge assets.
7. Embed knowledge assets (links, podcasts, videos, simulations, wikis, etc.) in standard business processes and provide access to those who need it.
8. Use standard legal and business rules and processes enterprise wide.

Technology Dimension

9. Use standardized, collaborative toolsets.
10. Use open architectures to permit access and searching across boundaries.
11. Incorporate a robust search capability to access contextual knowledge.
12. Use portals that permit single sign-on authentication for all users, including partners.

GLOSSARY OF TERMS

Combination	The process of converting explicit knowledge to explicit knowledge. Collecting, editing, and dissemination existing explicit knowledge to form a more usable explicit knowledge.[37]
Explicit knowledge	Knowledge that has been or can be articulated, codified, and stored in certain media. It can be readily transmitted to others. The most common forms of explicit knowledge are manuals, and documents, or other digital media.[38]
Externalization	The process of converting tacit knowledge into explicit knowledge.[39]
Information management	The function of managing an organization's information resources by the handling of knowledge acquired by one or many different individuals and organizations in a way that optimizes access by all who have a share in that knowledge or a right to that knowledge.[40]
Information technology	Any equipment or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency.[41]
Internalization	The process of converting explicit knowledge into tacit knowledge.[42]
Knowledge management	The development of tools, processes, systems, structures and cultures explicitly to improve the creation, sharing, and use of knowledge critical for decision making.[43]
Socialization	The process of converting tacit knowledge in one person to tacit knowledge in another.[44]

[37] Wang, "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance," 177.
[38] U.S. Army, *(AR) 25-1*, 121.
[39] Wang, "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance," 177.
[40] Chairman, U.S. Joint Chiefs of Staff, *Doctrine for the Armed Forces of the United States*, Joint Publication (JP) 3 (Washington, DC: CJCS, 14 May 2007), GL-15.
[41] U.S. Army, *(AR) 25-1*, 123.
[42] Wang, "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance," 177.
[43] DeLong and Seemann, "Confronting Conceptual Confusion and Conflict in Knowledge Management," 33.

Tacit knowledge	Knowledge that people carry in their minds and is difficult to access and not easily shared. People are often not aware of this knowledge they possess and how valuable it can be to others. It is considered more valuable because it provides context for people, places, ideas, and experiences.[45]

[44] Wang, "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance," 177.
[45] U.S. Army, *(AR) 25-1*, 130.

SELECTED BIBLIOGRAPHY

Ackerman, Robert K. "Defense Knowledge Management Hinges On Compatibility." *Signal* (1 May 2005): 23-27. http://www.proquest.com/ (accessed February 22, 2009).

Bales, Stephen H. "Burnout: Staff Exhaustion." *Military Review* (1 July 2008): 82-86. http://www.proquest.com/ (accessed March 22, 2009).

"Basex; Information Overload Now $900 Billion Cost to U.S. Economy." *Science Letter* (6 January 2009), 28-34, http://www.proquest.com/ (accessed February 22, 2009).

Bass, Samuel D. and Rusty O. Baldwin. "A Model for Managing Decision-Making Information in the GIG-Enabled Battlespace." *Air & Space Power Journal* (1 July 2007): 100-108,127. http://www.proquest.com/ (accessed March 22, 2009).

DeLong, David and Patrica Seemann. "Confronting Conceptual Confusion and Conflict in Knowledge Management." *Organizational Dynamics* 29, No. 1 (1 July 2000): 33.

"DOD Builds on AKO to Create 'DKO'." *Army Logistician* (1 May 2007): 47-48. http://www.proquest.com/ (accessed March 15, 2009).

Donnelly, Harrison. "KnIFE Against Terror." *Military Information Technology* (20 August 2007): 23-27. http://www.proquest.com/ (accessed March 15, 2009).

Lubit, Roy. "Tacit knowledge and Knowledge Management: The Key to Sustainable Competitive Advantage." *Organizational Dynamics* 29, No.4 (12 July 2001): 164-178.

Luthans, Fred. *Organizational Behavior*. 10th Ed. New York, NY: McGraw-Hill Irwin, 2005.

Mace, Brian A., and Gary Thomason. "Knowledge Management Is Combat Power." *Marine Corps Gazette* (1 June 2008): 37-40. http://www.proquest.com/ (accessed February 22, 2009).

Martin, Zachary D. "Tempo, Technology, and Hubris." *Marine Corps Gazette* (1 May 2007): 50,52-55. http://www.proquest.com/ (accessed February 22, 2009).

McCallun, Doug. "Avoiding the 'Army of Professional Amateurs' Paradox." *Defense & AT-L* 37, no. 2 (17 August 2008): 12-15. *Military & Government Collection*, EBSCO*host* (accessed February 24, 2009).

"Navy Learns Army Style." *Signal* (1 October 2002): 6. http://www.proquest.com/ (accessed March 15, 2009).

"Navy Updates Acquisition Instructions, Adds In Gate Review Process." *Defense Daily* (9 December 2008): 15. http://www.proquest.com/ (accessed February 22, 2009).

Peters, Katherine McIntire. "Intelligence lost." *Government Executive* (1 November 1996): 20-24. http://www.proquest.com/ (accessed March 20, 2009).

Raduege Jr, Harry D. "Network Operations Mandate Critical Considerations." *Signal* (1 July 2008): 100. http://www.proquest.com/ (accessed March 22, 2009).

Senge, Peter M. *The Fifth Discipline: The Art & Practice of the Learning Organization*. New York, NY: Doubleday, 2006.

Swartz, Nikki. "Tech Firms Battle Info Overload." *Information Management Journal* 42, no. 5 (1 September 2008): 20. http://www.proquest.com/ (accessed February 22, 2009).

Thariyan, Emlyn. "Transferring and Cultivating 'Deep Smarts' - A Force Multiplier in Modern Warfare." *Armor* (1 November 2007): 35-39. http://www.proquest.com/ (accessed March 15, 2009).

U.S. Army. *Army Knowledge Management and Information Technology*. Army Regulation (AR) 25-1. Washington, DC: Headquarters Department of the Army, 4 December 2008.

U.S. Army. “Army Knowledge Online.” https://www.us.army.mil/suite/page/doc/10713107 (accessed 21 March 2009).

U.S. Central Command. “CENTCOM Lessons Learned.” http://hqsweb03.centcom.smil.mil/lessons.asp (accessed 21 March 2009).

U.S. Joint Forces Command. “Joint Knowledge Online.” http://jko.cmil.org/about-jko (accessed 21 March 2009).

U.S. Office of the Chairman of the Joint Chiefs of Staff. *Doctrine for the Armed Forces of the United States*. Joint Publication (JP) 1. Washington, DC: CJCS, 14 May 2007.

U.S. Office of the Chairman of the Joint Chiefs of Staff. “Joint Lessons Learned Program.” CJCSI 3150.25D. Washington, DC: CJCS, 10 October 2008.

Vego, Milan N. *Operational Warfare*. Rhode Island: Naval War College, 2007.

Wang, Feng-Kwei. "Applying Case-based Reasoning in Knowledge Management to Support Organizational Performance." *Performance Improvement Quarterly* 19, no. 2 (April 1, 2006): 173-188. http://www.proquest.com/ (accessed March 15, 2009).

Weber, R. and D. Aha. "Intelligent Delivery of Military Lessons Learned." (15 July 2002). http://www.sciencedirect.com/ (accessed February 28, 2009).

Welch, Terry. “Navy E-Learning Afloat Achieves Milestones.” *U.S. Department of Defense Information / FIND*. (15 June 2007): 2. http://www.proquest.com/ (accessed March 15, 2009).